

## ROUND-THE-WORLD CARIBOU...

mountainside 250ft above the river bed. The Caribou is an old-timer in these Himalayan regions.

Supply dropping was done in the Shimshal area, four runs being completed in 12min with drops from 300ft above the valley bed; from this height each package was landed within 50ft of the target centre. The valley floor here is at 10,000ft a.s.l. Larger aircraft, not intended for such duties, would customarily let down from 20,000ft, drop a package from 1,000ft above the valley bed (inevitably wide of the mark) and climb straight up to 20,000ft again on the same heading before turning to repeat the procedure, since they naturally lack the Caribou's ability to manoeuvre within the valley.

Many strips were pinpointed (and indeed they are innumerable) which with a small amount of rock clearance could be easily used by Caribou. Thus remote hill people could be given amenities of air transport which would do more than most things to make them feel that Pakistan belonged to them.

Via Karachi and Sharjah the Caribou went on to demonstrate to the government and military authorities in Baghdad, and then to Kuwait, Riyadh and Jeddah. Its negotiation of soft desert sand—sometimes a more severe test than soft mud—had already been consistently proved in Saudi Arabia and the Middle East over a period of years.

The next presentation was in Ethiopia, where civil and then military demonstrations were made. Senior officers were flown into a difficult dropping zone near Debre Zeit, landing on unprepared ground, where 24 paratroops were briefed, loaded, and dropped. It was a normal operation except for the local altitude (8,000ft) and the high temperatures. Apart from military needs there exist some mountain resorts of historic interest that could be made accessible to tourist traffic by using strips in level areas that are too small to accommodate such aircraft as the DC-3.

At Nairobi, Prime Minister Jomo Kenyatta attended the presentation, discussion, film show and flying demonstration and spent 20min examining the Caribou. Comprehensive exercises were conducted for the authorities and the Kenya Air Force, which has

chosen the Chipmunk, Beaver, and Caribou for training and general purposes. Similar demonstrations were given at Dar-es-Salaam before proceeding to Salisbury.

Here, without preparation parachute jumps were made by the OC Rhodesian Air Force Paratroop Training and three of his instructors. Central African Airways (whose Beavers are famous for their high utilization) and the RAF gave excellent co-operation in this area and also in Lusaka, Northern Rhodesia (Zambia), where the Air Force, Army and Police all attended the presentation and conducted a full appraisal. The Prime Minister, Dr Kaunda, a keen supporter of aviation, participated actively, flying the aircraft from the right-hand seat.

Full procedures were completed at Entebbe and Kampala in Uganda. Of the 2,100ft paved strip cut into the hillside at Kampala at 3,600ft altitude about half the length was needed for take-off with full load, and about 600ft for landing. Dr Obote, Prime Minister of Uganda, took the right-hand seat for a flight to Lira, and back to Entebbe, for exercises with 28 special police and for Land-Rover loadings.

The aircraft next flew on to Juba, Khartoum, Benghazi, and Tripoli, whence a desert oilfield operation was conducted, and then a complete military demonstration was staged at Labragh near Beda, the administrative capital. Military equipment and equipped troops were quickly loaded and flown in various configurations and short-field conditions.

Refuelling at El Golea, the next landing was at Rabat, where a full-day demonstration was given for the Moroccan Air Force. A narrow 750ft taxi strip was used here at sea level and ISA + 15°C with full load including 28 troops.

Two calls were scheduled in Europe on this tour, the first at Madrid, where the party were told that such economical handling of military tactical operations had not been seen before. The last performance before crossing the North Atlantic was at Brussels, where an international military air display was in progress. Having civil registration the Caribou could not participate except as a static exhibit. A demonstration to the Belgian Air Force preceded the departure for Iceland, Greenland, and the Canadian homeland, where CF-OYE arrived, on schedule on Friday, July 3.

## FLIGHT-TESTING THE HFB 320 (continued from page 214)

as the aircraft tends to return itself to trim condition. These oscillations are sufficiently slow to allow the pilot to return the aircraft to trimmed condition without unusual effort. It is short-period oscillations which create problems for a pilot because, if they are very rapid, he may actually aggravate the situation when attempting to correct it. Short-period oscillations of the Hansa are so heavily damped as not to be evident after a disturbing input to the aerodynamic system.

Single-engine-manoeuvring tests have been made with one engine off and the other at maximum continuous power at 2,000ft. It is possible to make 30° co-ordinated turns both into and away from the dead engine with adequate control margin remaining. As can be seen from the results of the single-engine stall tests, the minimum control speed is less than the stalling speed of the aircraft.

Trim-change tests have been conducted using all configuration and power changes normally encountered in the take-off, landing and go-around manoeuvres. The direction of trim change is always positive, i.e., it always tends to hold the trim speed following a change of total drag or thrust. Control forces resulting from changing configuration are quite light and can easily be held with one hand.

### Engines and Systems

**Engine Operation:** The GE CJ-601-1 engines have operated without fault through the flight-test programme. One ignition box had to be changed owing to an excessive period of operation on the ground. Airstarts have been made over the complete operating envelope of the aircraft with consistent results at airspeeds down to 120kt.

No engine stalls have occurred even with throttle bursts at low airspeed at high altitude or during the aircraft stall tests. In the single-engine stall tests the "good" engine was operated at 98 per cent r.p.m. even with the aircraft in full stall at a 22° angle of attack. **Nacelle Cooling:** A climb test of cooling was conducted no one engine to 20,000ft, with 11min pre-take-off heat-soak time and 5min post-climb heat-dissipation time. The test showed no nacelle or engine-component heating problem.

**Hydraulics:** The hydraulic system, which is only for the prototype aircraft, was modified after the fourth flight owing to minor problems. It is now representative of the system for production aircraft, and from the fifth flight on there have been no hydraulic problems.

**Brake and Anti-skid System:** During the ten demonstration flights which have been made, and during seven other landings, maximum braking has been used to stop the aircraft, reliance being placed on the anti-skid system to prevent damage to tyres. To date there has been no excessive tyre wear, or overheating or warping of the brake discs.

**Electrical System:** This has been operated for extended periods on single generator and single alternator with no malfunctions or overheating.

### Next Phase of Testing

The prototype aircraft is now being fitted with additional test equipment and being modified for fuel capacity commensurate with that designed for the production aircraft. Following this work an intensive flight-test programme will be initiated for certification to CAR 4b and SR 422b requirements.